Bridgeport, Conn
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5 planets line up in unusual array

The five brightest planets visible from Earth have lined up in plain sight to form a spectacular celestial array that won't be seen again until 2040.

Through the next four weeks, Jupiter, Mars, Mercury, Saturn and Venus will appear tightly clustered in the Western sky. They will be visible in the evening with the naked eye.

Each evening, the alignment will assume different shapes, as the five planets take their orbital paths around the sun. The planets orbit in the same plane, like grooves in a phonograph record, only at different distances from the sun.

Similar bunchings occur every 20 years or so, though they are not always visible.

Scientists discover new order of insects

For the first time in nearly a century scientists have discovered a new order of insects.

The discovery by Danish and German researchers is detailed in a paper appearing in Friday's issue of the journal *Science*.

Just three of the paperclip-sized insects are known. They have been placed in the new category "mantophasmatodea."

The insects are just under an inch long and two of the examples under study in laboratories came from tropical Africa. The two had been in museums. An additional example was found encased in amber from Europe's Baltic region.

The age of the African examples, now held for study in museums, is not known. The example in amber "is 45 million years old, but you can argue that they are surely much much older," said Klaus-Dieter Klass of the Max-Planck Institute for Limnology in Plon, Germany.

He said that when comparing characteristics of these insects with known orders the researchers found they did not fit with any other group.

Pic-size of rodent's

A bug lady's life: Science columnist gets bigger buzz

● Ever wonder about the sex lives or flatulence rates of insects? May Berenbaum gives us the lowdown.

By F.N. D'ALESSIO
The Associated Press

URBANA, Ill. — Like many other columnists before her, May Berenbaum was tempted to turn some of her best pieces into a book. She succumbed, and "Buzzwords" is the result.

If Berenbaum's name doesn't seem as familiar as that of Art Buchwald or Dave Barry, it probably means the reader is not among the 7,000 or so insect specialists who belong to the Entomological Society of America and read Berenbaum's column in their journal, American Entomologist.

It's a serious journal and Berenbaum is a serious scientist – head of

glow-in-the-dark fungus gnat maggot or celebrating her favorite singer, "Weird Al" Yankovic, questions arise as to what sort of person Berenbaum is, and how she got that way. As a child, did she collect butterflies? Or did she fry ants with a magnifying glass?

"Absolutely not! And you should be ashamed of yourself for admitting you did, you awful person," she said in an interview.

"Actually, I used to be afraid of insects as a kid," she said. "I knew I wanted to be a biologist from a very early age, but I didn't get interested in insects until I was an undergraduate at Yale and took a course on terrestrial arthropods from a favorite professor who became my mentor. Insects are the most numerous terrestrial arthropods, and I got hooked."

And because insects can be found almost anywhere, they made good research subjects for Berenbaum, who suffers from a severe congenital form of motion sickness and doesn't

the Department of Entomology at the University of Illinois and an expert on the chemical interactions between insects and plants. But her column, also titled "Buzzwords," is funny. Seriously.

And "Buzzwords," the book published by the Joseph Henry Press (tellingly subtitled "A Scientist Muses on Sex, Bugs, and Rock 'n' Roll"), is funny enough that Barry himself contributed a dust-cover blurb.

That's fitting, since many of Berenbaum's subjects would be congenial to the Bard of the Booger. She devotes considerable space to flatulence (termites and cockroaches are major offenders), kinky sex (praying mantises may have an unjustly bad reputation, but dragonflies definitely like it really rough) and general lust (certain male beetles die a horrible death when denied sexual release).

She discusses – right up Barry's favorite alley – the occurrence of bot fly maggots in the nasal passages.

Berenbaum also examines images of insects in popular culture, particularly in rock lyrics and cheesy 1950s science fiction movies. She's become an expert on the latter genre through her role as founder and organizer of the university's annual Insect Fear Film Festival.

She also unknowingly lent her last name to "Bambi Berenbaum," a "luscious babe" of an entomologist featured in a 1996 episode of "The X-Files" titled "War of the Coprophages."

Because the real Berenbaum knows a bit about coprophages (dung eaters), scriptwriter Darin Morgan read some of her works while doing research and named his fictional creation in her honor.

Since she seems equally at home explaining the anatomy of the care to travel in search of specimens.

When Berenbaum does travel, medication and "barf bags" in hand, it's generally to scientific conferences. One of those trips, to the entomological society's 1991 conference, led to her second career as a columnist.

"Biologists all love ('The Far Side' cartoonist) Gary Larson, and we wanted him as a guest speaker, but he couldn't make it," she said. "The president of the society knew I was addicted to bad puns, so he asked me to fill in, and I did. I got some laughs, so he asked me if I wanted to write a column, and I agreed."

Now, biologists who might read other publications for Berenbaum's research on "Furanocoumarin metabolism in Papilio Polyxenes" can look to "Buzzwords" for her puns, as well as her views on such subjects as entomophagy (eating bugs).

Americans and Europeans may get a bit queasy at the thought, but the order Insecta is a frequent order "to go" in many parts of the world. And it's not just the worm in the tequila bottle or those plump grubs featured on CBS's "Survivor." Termites, beetles and crickets all have their aficionados.

"Cockroaches aren't that popular, but some tribal groups in Thailand do eat them," she said. "And locusts are even kosher – it says so right in Leviticus. So John the Baptist wasn't violating any dietary laws with his locusts and wild honey."

Once or twice a year, Berenbaum encourages members of an undergraduate class she teaches to chow down on a few creepy-crawlies.

But as many of the students notice, Berenbaum never eats the insects herself.

"I can't; I'm a strict vegetarian," she said.

Ancient Stingless Bee

Continued From Page C1

Kansas, concluded that the preserved features show the bee to be a new species of the genus Trigona in the subfamily of bees known as Meliponinae.

Although this species is now extinct, Dr. Grimaldi said, many stingless bees of the Meliponinae subfamily thrive in tropical regions. Of today's 20,000 bee species, one found in the Amazon basin and as far north as Panama is probably the closest relative of the fossil. In the Cretaceous period, the northeastern United States had a much warmer climate.

The oldest preserved bee previously discovered was about 45 million years old. But scientists have assumed that bees probably go back at least 125 million years. Fossils of pollen, leaves and even flowers indicate that this was the time when flowering plants appeared in profusion, and it is generally believed that bees evolved from ancestral wasps at about the same time.

The bee in amber seems to lend support to this timetable, or even to a much earlier appearance of flowering plants and bees.

Modern Wings and Hind Legs

Both Dr. Grimaldi and Dr. Michener noted the importance of the fossil bee being stingless. It was thus a fairly advanced species because it must have evolved considerably from ancestors with stingers. The females of most bee species have stingers, which are modifications of an egg-laying part of the body; male bees never have stingers. The fossil bee was female.

Other remarkably modern features of the fossil bee were its wings and hind legs, the entomologists said. The structure of the hind legs indicated that the bees carried pollen in the same way that modern bees do.

"This is very surprising," Dr. Michener said. "Most people would have thought that in 80 million years there would be more evolution than that. These must have had a good evolutionary condition then and just kept it."

Dr. Michener also suggested that to reach this advanced state, bees must have undergone "relatively rapid" evolution sometime before 80 million years ago. Thus, he said, the fossil bee certainly seems to confirm the idea that bees must be far older than 80-million years and probably date from at least 125 million years ago, or whenever flowering plants appeared.

Most scientists have long believed that the origin and diversification of flowering plants went hand in hand with that of bees, on the supposition that many flowers require bees to pollinate them and bees require flowers for the proteins from pollen and carbohydrates from nectar.

> 'I knew immediately this was the oldest bee.'

Seeds in a Pod

James A. Doyle, a paleobotanist at the University of California at Davis, said recent findings indicate that some flowering plants may have emerged as much as 200 million years ago, long before the Cretaceous period. That would be consistent with the new possibility that bees, too, could have originated much earlier than had been thought.

The clearest plant fossil evidence, Dr. Doyle said, shows that angiosperms, the hardiest and most prevalent flowering plants, were not widespread until about 125 million years ago. Their "big burst" across the land began about 110 million years ago, he said.

Angiosperms had seeds enclosed in a pod. This was a major evolutionary development because it afforded more protection for seeds and improved their chances for germination. Some of the earliest flowering plants are similar to water lilies and sycamore trees. The magnolia family also goes back to the middle of the Cretaceous period.

"It seems that the diversification of angiosperms did take place in the Cretaceous," Dr. Doyle said. "The big question is, how that relates to their actual origin."

If that question is ever answered, scientists said, the time of the origin of bees might also be determined.

Amber found in the future may provide more clues. The oldest insects of any kind found entombed in amber come from Lebanon and are about 120 million years old.

The Living Section
Wednesday in
The New York Times
page C-4 col 5,6
8 Dec 1987

40-Million-Year-Old Extinct Bee Yields Oldest Genetic Material

By MALCOLM W. BROWNE

By extracting gene fragments from insects preserved in amber for up to 40 million years, two independent teams of scientists have obtained the oldest DNA ever recovered from fossils.

Both groups of researchers succeeded in extracting fairly long sequences of nucleic acids, the building blocks of genes, from extinct insects embedded in amber found in the Dominican Republic.

They said the successful extraction of DNA from ancient amber-embedded specimens proved that substantial amounts of DNA could survive for many millions of years, far longer than many scientists had believed possible.

Analyses of the DNA found in the specimens has improved understanding of the evolutionary lines to which the extinct insects belonged.

Keith Meyers/The New York Times

A study involving the extraction of DNA from an extinct termite preserved in amber for 25 million to 30 million years, above, challenges a formerly popular theory that termites evolved from cockroaches.

Popular Theory Challenged

One analysis, which focused on a newly discovered extinct termite called Mastotermes electrodominicus, was conducted by Dr. Rob DeSalle, Dr. Ward Wheeler and Dr. David Grimaldi of the American Museum of Natural History in New York City, and John Gatesy of Yale University.

Their analysis, which is being published today by the journal Science, challenges a formerly popular theory that termites evolved from cockroaches. Instead, analysis of the DNA fragment extracted from the extinct termite, embedded in amber 25 million to 30 million years old, supports a view that termites and roaches evolved separately from a common ancestor.

Another investigation, the results of which were published this month in the British journal Medical Science Research, examined genetic material recovered from a 40-million-year-old extinct stingless bee called Proplebeia dominicana. The study was conducted by Dr. George O. Poinar Jr., an entomologist of California

dinosaurs are created from gene grafts of dinosaur DNA extracted from fossil flies in amber. Dr. Poinar himself, and several other scientists, are assisting Steven Spielberg's organization in making a movie based on the novel.

But in real life, the problems in reconstructing a dinosaur (or any other long-extinct animal) from fragmentary gene sequences would be staggering if not completely insoluble, experts agree.

The magnitude of the task is illustrated by the DNA sequence extracted by Dr. Cano and his colleagues from the ancient stingless bee. This DNA fragment is only one ten-thousandth of 1 percent of an entire gene, of which vast numbers are required to make up a single chromosome in a chain of chromosomes. Moreover, the DNA preserved in amber or any other medium is always damaged or degraded by time and environmental influences.

Neither the Museum of Natural History team nor the California group could even guess where the DNA fragments they extracted fit within any specific chromosomes of the insects they studied.

"The most anyone could ever get from fossil DNA is some molecular sequences that might be grafted into the genes of some living creature," Dr. Poinar said. "But that would require a great advance in cell biology. Remember, no one has yet cloned animal cells."

Science Fiction and Reality

Still, the notion of creating animals similar to dinosaurs by grafting dinosaur DNA into living DNA from some modern species is not totally ruled out, some scientists believe. "'Jurassic Park' is science fiction, of course," said Dr. Wheeler of the Museum of Natural History, "but Crichton has been careful to keep his speculations within the bounds suggested by real technology."

Amber mined in the Dominican Republic formed many millions of years ago from the sap of an extinct tropical legume called Hymenaea, Dr. Grimaldi said. Once the sap hardened as a plastic-like polymer, it became nearly as impermeable as glass. The amber polymer completely dries the body of any animal trapped in it and locks out any oxygen that would promote decomposition. The sap acts as a preservative in another way: it contains substances that kill bacteria that would otherwise rot tissue.

Dominican amber, regarded as a treasure house of biological specimens dating from the Miocene, Oligocene and Eocene epochs, is too young for the age of dinosaurs. Amber old enough to have formed while the dinosaurs were still alive occurs mainly in Lebanon.

Veto of Family-Leave Bill

50 or more people to allow workers up to 12 weeks of leave, without pay but with continued health insurance coverage, for personal or family medical emergencies.

"When it comes to family leave," he said, "President Bush is saying 'read my lip service to family values'."

Senator Edward M. Kennedy, Democrat of Massachusetts, said: "We know that Bill Clinton would sign it if he were in the White House."

Senator G. Orrin Hatch, Republican of Utah, argued instead for Mr. Bush's recent proposal to give tax credits to employers who offer family-leave policies, saying, "No one wants to help American families more than President Bush does, or I do." He complained that the vote amounted to no more than a "big political game" because advocates knew the House would sustain the veto.

Fourteen Republicans, including seven who need Democratic votes in tough races this fall, voted with 54 Democrats to override the veto. One Republican in a tough race, Senator Bob Kasten of Wisconsin, voted with Mr. Bush; another, John Seymour of California, did not vote. Three Democrats voted with 28 Republicans to back the President.

House Girds for Battle

House Democratic leaders met this afternoon to go over lists of their colleagues to see if they could reduce defections, even if they could not assemble the two-thirds vote to override.

They decided not to vote today or Friday, in part to gain time to twist arms and in part to let today's victory in the Senate, however ephemeral, stand and get publicity. The vote is now expected to be held next Wednesday.

The leading sponsor of the bill, Senator Christopher J. Dodd, Democrat of Connecticut, said there was a Democratic effort "to embarrass the President." He cited a long list of Democratic supporters to prove the bill was a bipartisan battle, never before.

Senator Christopher S. Bond, Republican of Missouri, urged support of the law, saying, "We should not force a mother to leave her baby days after its birth, in order to keep her job."

And Senator Bob Packwood, Republican of Oregon, said that the bill was "the fair thing to do, the right thing to do."

But more Republicans spoke against the bill. Senator Don Nickles of Oklahoma said, "We don't need the Federal Government coming in with this dictatorial stance."

O MACY'S GIFT

O RACK SYSTEM, CAMCORDE

Scientists claim bug to be world's oldest

By LINDSEY TANNER
Associated Press Writer

CHICAGO — To the uninitiated, it looks like two small specks. But to paleozoologist Conrad Labandeira and colleagues, the fossil of a pop-eyed bug represents the oldest insect known, dating back some 390 million years.

Their findings, reported in Friday's issue of the journal Science, describe the remarkably well-preserved fragments of a wingless bug found in a chunk of mud on the north shore of Quebec's Gaspe Bay. A member of the most primitive order of insects, it was similar to modern-day silverfish.

Even more significant than the fossil's age, scientists say, is that similarity to modern bugs, suggesting that insects originated many millions of years before the specimen lived.

"What we have is two fragments. We have a head capsule 0.7 millimeters wide and we have a thorax 1 millimeter long," Labandeira, a 38-year-old graduate student at the University of Chicago, said Friday.

"Even though they're separate, we're very convinced that they belong to the same individual," he said.

Insects are a class of animals characterized, as adults, by a body divided into head, thorax and abdomen, three pairs of legs on the thorax, and usually two pairs of membranous wings.

The prehistoric bug described in Science was found by Francis Hueber, a noted Smithsonian Institution paleobotanist who retrieved the specimen about five years ago while examining a mud sample he had found on the Gaspe Peninsula.

Its importance was only recently discovered when he and other scientists compared notes.

Hueber's interest was in prehistoric plant fragments in the dirt, but what looked like ancient insect parts caught his eye.

"He had an idea that there was something very important" about the fragments, Labandeira said.

Through sophisticated dating techniques, Hueber "determined that it was an early arthropod and probably an insect," said Bret Beall, a scientist at Chicago's Field Museum who has been working with the specimen. The arthropod phylum — inverterbrate animals with jointed legs and segmented bodies — includes spiders and crustaceans like shrimp and crabs, for example, as well as insects.

"He knew that if this was an insect fossil it would be very significant," Beall said.

So Hueber handed the specimen over to Beall, who, with Labandeira's help, determined that it was in fact an insect and what they believe is the oldest one known in the world.

It lived 390 million to 392 million years ago and predates what was previously believed to be the oldest insect — an eye fragment found in upstate New York — by about 15 million years, they said.

Its most imposing features were its two disproportionately large eyes on each side of its head. It also had two antennae and two armlike appendages that appear to have been equipped with sensors to detect odors and vibrations.

"The significance is that they have a head, so it's really a clincher that there were insects at that time," said William Shear, a biology professor at Hampden-Sydney College in Virginia, where the New York specimen is being studied.

"The evidence we have — part of an eye and hundreds of scraps of body parts — were suggestive, but not really conclusive," he said. But with the Gaspe finding, "we now know that there were primitive insects back that far. Nobody can challenge that now," Shear said.

"The exciting thing to me is that these insects have changed very little as far as we know in almost 400 million years," he said. "That suggests that they were almost already modern in form 400 million years ago, that they had a long history before that."

The insect, now with Beall at the Field Museum, will eventually be sent to the Smithsonian Institution in Washington for their perma[illegible] collections, Labandeira s[illegible]

Kennebec Journal, August 8, Maine Page B-11 12-13 Nov 1988

Bridgeport Post-Telegram Bridgeport, Conn., November 12, 1988

Conrad Labanderia shows his greatly enlarged drawing of what may be the world's oldest insect, dating back 390 million years.

Fossil find believed world's oldest insect

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tion, class is the third division of living beings, following kingdom — plant or animal — and phylum. Each class is further broken down into orders, orders into families, etc. to the level of species. The earliest representative of mammals, the class to which humans belong, dates back about 200 million years.

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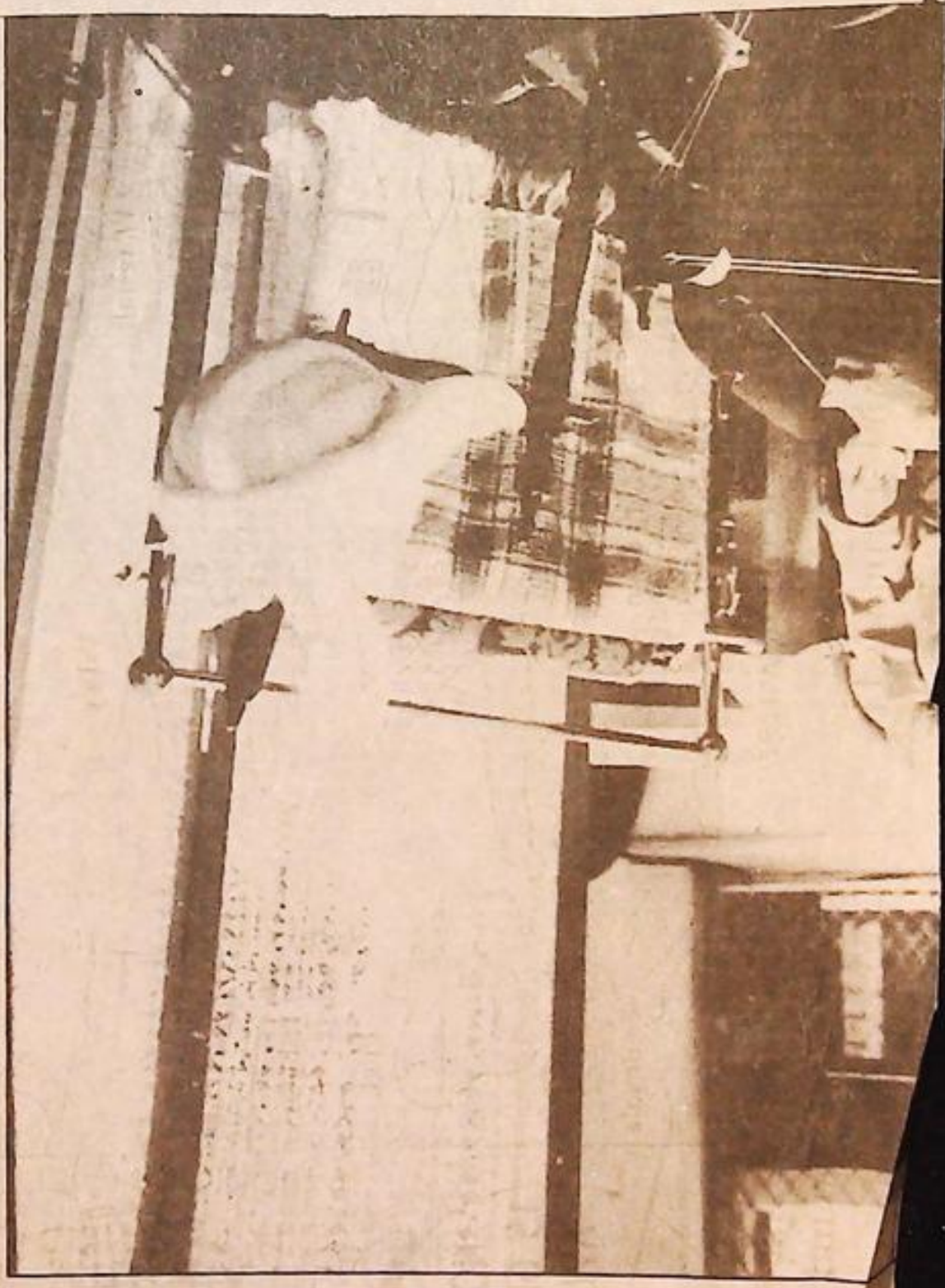

It May Be Elusive but Moth With 15-Inch Tongue Should Be Out There

By NATALIE ANGIER

An orchid needs a long-tongued insect to reproduce.

It may never have been seen by human eyes, and it certainly has never been described in the scientific literature, but somewhere in the dense tropical highlands of Madagascar there must flutter a moth with a tongue that measures 15 inches in length, a scientist says.

Speaking recently at an entomology meeting in Reno, Nev., Dr. Gene Kritsky of the College of Mount St. Joseph in Ohio said that there was no alternative but to posit the existence of a giant moth with a six-inch wingspan and a longer proboscis than any

Tongue

Portrait of an Unseen Insect

The existence of a rare orchid with a 15-inch-deep nectar tube has led to the hypothesis that a giant Madagascar moth with a 6-inch wingspan and a 15-inch proboscis must also exist. Above, an artist's version of the only creature that could pollinate the orchid, with its tongue uncoiled.

yet seen on an insect. He made his prediction based on the existence of a rare orchid in Madagascar, a flower that could only be pollinated by a moth able to stick its tongue way down a tube where a pool of tempting nectar is hidden.

The tube of the orchid species, called Angraecum longicalcar, is 15 inches deep, and it hangs down from the blossom's stem like a whip; the nectar fills up about six inch on the bottom. Thus, said Dr. Kritsky, a moth would need to uncoil its proboscis to 15 inches to reach into the tube, collect a nectary, suck up the juice and simultaneously detach the orchid's pollen packet at the same time. Dr. Kritsky believes that the pollinating moth is a member of the sphinx moth family, and that it would be found in a dispersed scientist willing to brave Madagascar's political chaos were to search for it.

Taking a Cue From Darwin

"The orchid and its pollinator must have co-evolved," said Dr. Kritsky. "The orchid could only survive if it had a moth pollinator."

The entomologist said he was doing nothing more than taking his cue from Charles Darwin, the great naturalist and occasional nonbeliever. In 1862, while studying a Madagascan orchid, Angraecum sesquipedale, Darwin proposed that there must be a moth with an 11-inch tongue, able to dip into the flower's four-long nectary and pollinate it. In 1903, two entomologists discovered a sphinx moth in Madagascar with a proboscis that matched Darwin's prophecy.

While rummaging through a museum history library last spring, Dr. Kritsky came upon a description of an orchid with an even longer nectary, and he decided it must have a pollinator with an even lengthier tongue. Other entomologists who heard his proposal also agreed.

"It seems highly likely that another species of moth with a slightly longer proboscis is out there, able to pollinate that orchid," said Dr. Nathan M. Schiff, a research entomologist with AFCR Research Laboratory in Beltsville, Md., a Government agency. "Darwin got it right, and Gene Kritsky is just following in his footsteps."

Dr. Kritsky said that the orchid and its fertilizing insect probably evolved together over time, with the nectary getting a bit longer, and the moth's tongue following suit, until the relationships between the two became exclusive, a type of interdependence that suited both: the moth, because it could always be assured of a nectar drink from the orchid, which no other insect could penetrate; and the flower, because it could guarantee that no pollinator would be focusing its efforts on hapgalicar and therefore would be likely to deliver fertilizing pollen from one bloom to another.

Projectiles Trap Insects

Dr. Kritsky said that the orchid discouraged small, scavenging insects like ants from crawling down its tube or gorge on its precious nectar with fingerlike projections along its nectary lining that trap the insects.

To retrieve nectar from the flower, he said, a sphinx moth would have to settle on a lip at the edge of the skinny tube, and carefully unwind its proboscis. As the moth probed, a pollen packet would shake loose from the orchid and stick to the moth. When the moth flew to another orchid, the packet would become detached and fertilize the recipient flower.

Dr. Kritsky said he has never seen the longicalcar orchid himself, but that the Cincinnati Museum of Natural History, where he works as an adjunct curator, is trying to get a sample. As for its furnishing moth, because the insect is likely to be nocturnal, and because it would love to a remote region of the Malagasyan jungle, where the longicalcar orchid blooms, it may never have been seen by a human being.

"Nathan Schiff told me I had to go find this thing," said Dr. Kritsky. "He said if I didn't, he would do it himself."

Nitric oxide a real turn-on for fireflies

By LEE BOWMAN
Scripps Howard News Service

It turns out that what turns a firefly on and off is the same molecule — nitric oxide — that makes human blood vessels dilate and allows Viagra to treat erectile dysfunction.

While scientists have known for some time about the chemical reaction that makes a lightning bug light, they were stumped about how the winged beetles manage to blink their tiny lamps so precisely.

"Now we have the missing piece of the puzzle that explains how they're able to throw the switch on and off," said Barry Trimmer, an insect neurobiologist at Tufts University and lead author of the new study published Friday in the journal Science.

There are at least 170 species of fireflies in the United States, with several represented in most backyards. Males and females find each other by using different sequences and patterns of flashes from their lanterns.

"Fireflies are very romantic beasts, because their whole adult life is spent courting," said Sara Lewis, an evolutionary ecologist at Tufts. On a typical summer's night, lightning bugs of different species and sex fire up gradually, some preferring to mate around dusk, others waiting for full darkness. Males tend to do most of the flying; females blink back from leaves and branches.

The summertime light dance of the fireflies is an absolutely critical moment in the life of the small insect, Lewis said.

Fireflies live for two years as larvae, eating worms in the soil, and for just two weeks as adults — enjoying just 14 nights of flying, flashing and courtship. Then it is all over.

"For them, it is a very short, intense time," she said.

While many creatures, from jellyfish to bacteria, have some ability to glow in the dark, Lewis notes that "the firefly's talent for producing precisely timed, rapid bursts of light is quite rare" and worthy of study just for their novelty.

The discovery by an interdisciplinary team that included researchers from Brigham and Women's Hospital in Boston also sheds new light on the roles nitric oxide can play in carrying messages between cells of many living things, including humans.

People suffering from heart pain have been popping nitroglycerin pills for decades, although scientists didn't find out how nitric oxide signals smooth muscle cells lining blood vessels to relax until the 1970s. But if the body produces too much nitric oxide, as it can from trauma or disease, blood pressure can plummet.

Nitric oxide stimulates brain functions involving learning and memory, and is used by the immune system to fight infections and battle tumors. "It's the smallest molecule known to carry messages between cells," said Dr. Thomas Michel, a Brigham and Women's cardiologist, a co-author and Lewis' husband.

In fireflies, the urgent message is passed to a ring of cells around the edge of the lantern region. These cells are packed with mitochondria, miniature power plants that consume oxygen as they produce energy.

The Massachusetts scientists examined the structures inside the firefly lantern and found that the oxygen-burning cells normally act as gatekeepers, preventing oxygen from reaching and reacting with light-producing chemicals in the lantern.

Lowdown on lightning
They're beetles, not flies.
More than 170 species in the U.S., but none of the flashing type of fireflies is found west of the Rocky Mountains.
Around most of their U.S. range, they show up in June and are gone by the end of August; they tend to favor shaded lawns and damp areas, like bogs and marshes, but some species also thrive in deserts.
In a few species, femme fatale fireflies mimic the signals of females of other species to lure the males, then eat them.
Classic lightning bugs light up with a chemical reaction that takes place in special cells in their abdomen. The chemical reaction is controlled by the amount of oxygen that the firefly allows into its abdomen.
They flash because within each species, males and females identify members of the opposite sex based on the timing and movements of their flash.
Some species don't light at all, but release special scents to help potential mates find them.
In the new research at Tufts University, scientists found that the control mechanism involves a set of gatekeeping cells that normally keep oxygen from reaching the light-up cells. These biological switches are shut down by the messenger molecule nitric oxide, allowing oxygen inside the lantern and turning on the light for a brief second or two.
Scripps Howard News Service graphic

In the presence of oxygen, the lantern lights up. That's why, if you accidentally squish a lightning bug or one splats on a windshield, the luminescent glow is seen for several minutes until the stored chemicals are used up.

When the bug's nervous system sends a particular signal to gatekeeper cells, they produce nitric oxide, which shuts down respiration. That allows oxygen to slip past the gatekeepers and reach the chemicals in the light cells, producing the glow.

The researchers tested this mechanism several ways, from putting fireflies in containers pumped with increasing quantities of nitric oxide (they glowed ever brighter) to shutting down the signal to produce the molecule, causing the bugs to go dark.

Other research has shown that light inhibits nitric oxide, so the fireflies' lanterns themselves act as their dimmer. As the nitric oxide signal fades, the mitochondria resume gobbling oxygen, and the lamps shut down.

"So, amazingly enough, it's a temporary cut in the power supply that probably triggers the firefly flash," Trimmer said.

On the Net:
www.sciencemag.org
ase.tufts.edu/biology
iris.biosci.ohio-state.edu/projects/ FFiles/
Fireflies:
www.newton.dep.anl.gov/newton/askasci/1993/biology/bio048.htm
Science: *www.eurekalert.org*

— The Associated Press contributed to this report